

Comparison of snow depth on the sea ice between buoys and CFSR data

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To understand snow depth distribution on Arctic sea ice, we compared the snow depth data on the Arctic multiyear sea ice obtained by Ice Mass Balance (IMB) buoys developed by CRREL (Cold Region Research and Engineering Laboratory) with reanalysis data of the Climate Forecast System Reanalysis (CFSR) provided by National Centers for Environmental Prediction (NCEP). In this study, we examined 23 buoys in 2002-2013. Although mean annual cycle of snow depth from the CFSR was reproduced well, the reanalysis data has a positive bias during winter and spring, and a negative bias during summer and autumn. Because the correlation coefficients between the reanalysis and observation are around 0.70 between October and December. Sea-ice thickness in the reanalysis was approximately 1 m thicker than the observations during all seasons. We investigated recent changes in snow depth and sea-ice growth rate during autumn and early winter using the reanalysis data. Due to enhanced cyclone activity and enhanced surface evaporation from the ice-free ocean, the increases in precipitation (i.e., snow depth) are seen over Chukchi and Beaufort seas, resulting in reduction of growth of thin ice during November. However, ice thickness anomaly in the CFSR reduced an insulating effect of the snow depth on sea-ice growth. We will discuss about sea ice thickness anomaly in the CFSR using 1-D thermodynamic model.

Keywords: Snow depth, Sea ice thickness, buoy, arctic